GmbH

BMR®

The Sign of Quality
Made in Germany

SFU 0102

Schnellfrequenzumrichter
High Frequency Converters

HIGH QUALITY

100%

MADE IN
GERMANY

EXCELLENT SERVICE

CONTENTS
Issue June 2016

1.   Introduction

Depending on its construction, the speed of a three-phase a.c. motor is directly dependent on the number of poles and the frequency of the network. In a 3ph 380V/50Hz network, with a 2-pole motor, the rated speed would be 50 U/s * 60 = 3000 Upm.
With d.c. motors (brushless d.c.), the speed is dependent on the voltage applied

Three-phase a.c. motors provide numerous benefits in industry, such as brushless operation, freedom from wear and tear, favourable capacity/weight ratio, high-speed capability, and much   more. These motors can be used many different application areas, such as milling and grinding spindles, or with drilling machinery, for example.

D.C. motors have the advantage of a high power efficiency (approx. 85%) when compared with a.c. motors, but the disadvantage of not quite reaching the torque of an a.c. motor at low speeds (when starting), nor reaching the high speeds of an a.c. motor. However, the higher efficiency also means cooling requirements are lower and dimensions can be smaller.
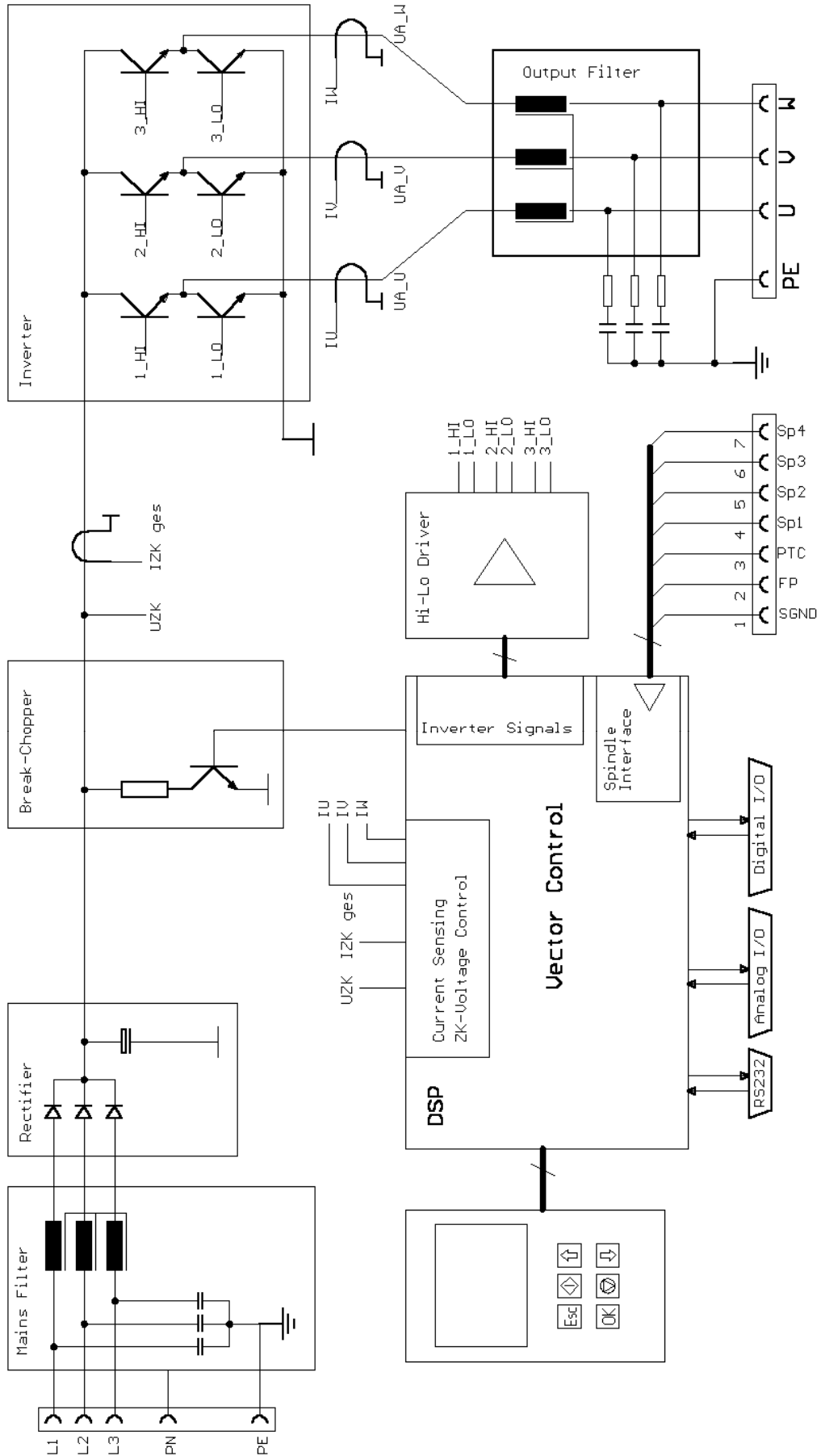
In the aforementioned applications, three-phase a.c. motors are operated using special control gear – frequency converters. These frequency converters convert the fixed 50 Hz network into a 3-phase network with variable frequency and voltage. This greatly reduces the start-up problems and the high starting currents that are inevitable when high-capacity three-phase a.c. motors are connected to a fixed network. The motor is controlled according to a special characteristic curve until its rated speed has increased, or it has been stopped.

The **SFU 0102/0202 -** series frequency converter has been specially designed for use in these high frequency applications, offering excellent safety, performance and reliability, the result of years of experience in the design and construction of frequency converters, together with the use of the latest materials and the most reliable components. It can be used in many different applications and is as equally suitable for use as a replacement device in existing systems with older type series as it is in pre-planned applications as a cost-effective solution, helping to prolong the useful life of tools. In addition, both a.c. and brushless dc motors can be operated by this high frequency converter.

2. Description and Features

✓ Operation of **a.c. and bldc** spindles

✓ The frequency converter **SFU 0102/0202** allows **output frequencies** up to **200 Hz / 120,000Upm** with 2-pole AC motors and **1000Hz/ 60,000Upm** with Bloc-motors.

✓ **Output power (250VA-0102 / 400VA-0202)**

✓ The Kernel of the SFU-0302 **is** a **Digital Signal Processor** (DSP), which generates all output variables and captures signals.

✓ All parameters, such as current, voltage and frequency, are captured in **real time**, and adjusted by implementing via the **Vector Control** according to loading.

✓ The **highest efficiency** of motors at **both low and high frequencies** is made possible.

✓ High level of **operational safety**. All operating states such as acceleration, operation at rated speed, and deceleration, are monitored and critical statuses are intercepted and brought under control.

✓ **Transparency**: The user is continuously informed of the status of the frequency converter and the motor / spindle by means of a 4-column plain-text display on the front panel (LED panel optional).

✓ **Control:** The frequency converter can be manually controlled and calibrated as required using 6 keys on the front panel.

✓ **Individual adaptation** to the application in hand and the spindle in use. Up to 16 different spindle characteristics can be created and stored in the memory of the frequency converter, or existing characteristics can be modified and adapted to the application.

✓ **Diverse control and communication possibilities.** for connection to peripheral devices to - PC , PLC (Programmable Logic Control), CNC (Computer Numeric Control).

✓ **Straight-forward and flexible integration** into existing systems by means of open configuration of I/O signals for control and configuration:
Control inputs: 1 analogue, 3 digital
Control outputs: 1 analogue, 5 digital (relay)

✓ **Galvanic separation** of all interfaces from each other and from the network / motor potential

✓ **Short-circuit-protected**

✓ **User-friendly configuration** and control using optional Windows Software for the PC

3. Block Diagram

4. Technical Data

Output power	0102: 250VA	0202: 400VA
Supply connection	230V, 50Hz / 115V, 60Hz switchable with rotary switch and with exchange of fuse	
Fuse	230V: 2,5AT 115V: 4,0AT	230V: 3,15AT 115V: 5,0AT
Motor connection	Desktop: 7-pin: U, V, W, PE, 2*PTC, SGND Connector: Amphenol C16-1 (6+PE) / Binder 693 (6+PE) or Hirschmann connector SSE and 19"Rack: 8-pole: U, V, W, 2*PE, PTC, FP, SGND Screw terminals 4mm²	
Output voltage	max. 36V	max. 60V
Output current	Electronically limited	
Over-current	to be set up for 20s	
Output frequency	AC: 2.000Hz / 120.000 Upm DC: 1.666Hz / 100.000 Upm	
Spindle characteristics	max 16, stored internally, freely definable	
Spindle sensor inputs	PTC, magneto-resistor, logic	
Control inputs	1 analogue: 0-10V, galvanically separeted	
Control inputs	3 digital: 0- 24, galvanically separeted	
Control outputs	1 analogue: 0-10V, galvanically separeted	
Control outputs	5 digital: relay outputs, 24VDC/1000mA, 125VAC/500mA	
Interface	RS232 galvanically separated, 9600Bd	
Housing dimensions W x H x D (mm)	(Desktop) 290 x 107 x 295 (SSE) 117 x 380 x 270 (19") 480 x 135 x 280 3HE / 84TE	
Weight	(Desktop) ca. 6 kg (SSE) ca. 7 kg (19") ca. 8 kg	
Protection	IP20	
Operating conditions	5°C … 40°C / rel. humidity of air max. 85%	

CAUTION: **To avoid severe motor / spindle damage,
select correct motor / spindle characteristic!**

5. Safety-Precautions and Warnings

✓ This device produces dangerous electrical voltages and is used for the operation of fast spinning tools. Because of their high rotational speed, it may be dangerous in case of improper handling. For this reason, only professionally trained and qualified personnel should be allowed to work with and setup this device!

✓ Before the first commissioning can be carried out, it should be ensured that the spindle and the tool are fixed properly, to eliminate all dangers because of uncontrolled movement of the spindle.

✓ Safety regulations being valid for the country where the device is used, have to be adhered to where any work is carried out on the device.

✓ Before the device is turned on for the first time, it should be verified, that the connected parts cannot carry out uncontrolled movements.

✓ The frequency converter must not be operated close to heating devices or magnets or devices generating strong magnetic fields.

✓ Sufficient air circulation around the converter should be ensured.

✓ Fluids should be prevented from intruding into the housing. If it seems to be happened, the converter has to be switched off immediately.

✓ The ambient air must not use aggressive, flammable or electrically conductive substances and should be as free of dust as possible.

✓ All repairs and maintenance on the converter and the relating accessories must be carried out by skilled personal and with powered off, only. To ensure this, the mains plug should be pulled out. In doing this, both the terms of regulations for preventing accidents and the general and national rules for mounting and safety have to be applied.

✓ Do not open this device while it is connected to power supply. There is danger of life!
With opening this unit the period of warranty will be ended.

✓ All people who work with this device should be trained and instructed by their line advanced technician.

⚠️ **Attention:**
Please verify that all power supply voltages are correct in polarity and value.

⚠️ **Attention:**
Please ensure to have the proper characteristic selected, always!
The operation of a spindle with a wrong characteristic may harm the spindle severely!

⚠️ **Attention:**
In case of replacing the fuses, please ensure to use types only, which are mentioned in 'Technical Data'!

6.   Connections, Interfaces and Pinouts

Operational parameters and outputs:
The **SFU 0102/0202** covers all current important operational parameters and operating data.
Up to 6 digital outputs can be used for signalling and up to 1 analogue values can be output
to the analogue outputs (0-10V).

Remote Control and Outputs:
6 digital inputs (24V) and 1 analogue inputs (0-10V) are available for remote control of the
**SFU 0102/0202**.

These assignments can be freely configured. Using the optional Windows PC software **SFU-
Terminal** the above assignments can be easily achieved, providing exceptional flexibility with
each application.
Each operating parameter can be assigned as a signal and each control signal can be
allocated the required I/O pin. In addition, the logic level (high or low active) can be
individually defined.
The same assignment is also possible for the analogue measured data and control data at
the analogue I/O pin.

The standard allocations of operational parameters, their outputs, control signals and inputs,
are listed in the following table.

6.1 Digital and Analogue I/Os (D-SUB 15 female)
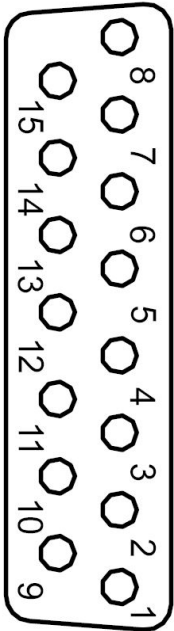
Pin	Function	Description
1	common connection for relays	
2	Relay 1 (normally open)	**Rotational Speed Reached**
3	Relay 2 (normally closed)	**Superheat**
9	Relay 3 (normally open)	**Standstill of Spindle**
10	Relay 4 (normally closed)	**Overload Spindle**
6	Relay 5 (normally open)	**Converter and Spindle Ready**
4	Analogue Output	**Load Value** 0 … 10V = 0 … 100% or Duty
11	Analogue Input	**Drehzahlvorgabe**
8	Ground	
12	Digital Input 1	**Start / Stop**
15	Digital Input 2	**Interlock (Emergency Stop)**
5	Digital Input 3	**Reversing of Direction of Rotation**
13	RxD	(RS 232)
14	TxD	(RS 232)
7	Impulse magneto resistor	Speed sensor

## 6.2 Spindle Output using standard circular connector

with 3-pin DIN-jack
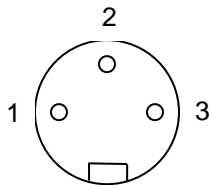
Pin	Function	Description
1	U	Spindle Phase 1
2	V	Spindle Phase 2
3	W	Spindle Phase 3

with 7-pin jack Amphenol C16 (Amphenol C16-1 / Binder 693)
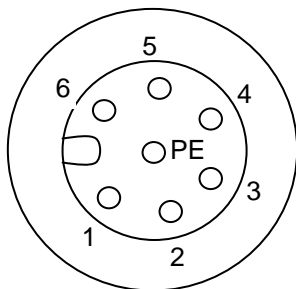
Pin	Function	Description
1	U	Spindle Phase 1
2	**PTC**	PTC-Signal (Spindle temperature)
3	V	Spindle Phase 2
4	FP	Hall-Sensor-Signal
5	**W**	Spindle Phase 3
6	SGND	Signal- GND for PTC-Signal
7	**PE**	Protective Earth

with 7-pin jack for Jäger-Spindles (Hirschmann C164)
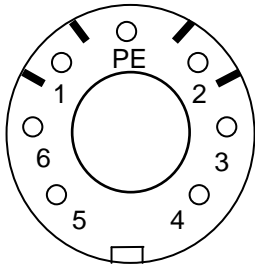
Pin	Function	Model +5 V Sensor
1	NC	NC
2	R	R
3	S 3 Phases for Spindle	S 3 Phases for Spindle
4	T	T
5	+ PTC	**+ 5V**
6	+ Hall Sensor	+ Hall Sensor
7	Signal Ground	Signal Ground

6.3 Spindle Connection with Screw Terminals versions SSE, 19"
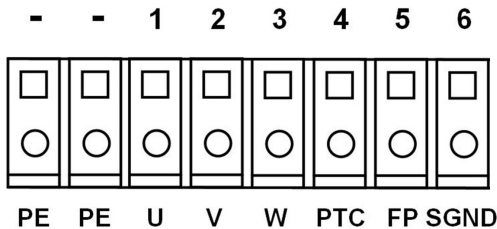
Function	Description
PE	Protective Earth
PE	Protective Earth
U	Spindle Phase 1
V	Spindle Phase 2
W	Spindle Phase 3
SGND	Signal-GND for FP-and PTC-Signals
FP	Hall-Sensor-Signal
PTC	PTC-Signal (Spindle temperatur)

6.4 Mains supply

desktop: 3 pin. standard plug
SSE or 19":   Screw terminals, 4mm^2

To adapt the mains supply voltage to 230V and 115V networks a selection can be done with the help of a rotary switch

⚠️ **It is important to select the appropriate mains fuse ! The required value is listed under 4.**

⚠️ **ATTENTION:**
This setting has to be carried out by qualified personal, only!
A wrong setup will cause immediate destructions of the device after power on

⚠️ **Control cables, supply cables and motor cables have to be run separated from each other. Shielded cables are to be preferred.**

7. Functions, Commissioning, Operation

3 operational possibilities:

- ✓ Control and configuration manually via front keys
- ✓ Automatic control and configuration via PLC / IPC
- ✓ Automatic control and configuration via PC (RS232 interface)

Setup and control of the features and functions listed below can be carried out with our setup software **SFU-Terminal.** All explanations and hints to menu functions relate to this software.

> **CAUTION: The operation of a spindle with a wrong spindle characteristic may cause severe damages at spindle or converter.**
> **To avoid this, please ensure that the correct spindle characteristic is selected!**

7.1 Configuration of rotational speed

The preset of revolutions per minute of the spindle can be achieved by two ways:

- ✓ **Preset manually via panel keys**
  In menu 'Analogue Inputs' option button `0V` has to be enabled in the line of duty RPM . (no analogue input is assigned to this function)
  The duty RPM is displayed on the LCD and can be changed with `UP` / `DOWN` (holding a key down increases the count rate). RPM can be changed during operation

- ✓ **Preset via analogue input** duty RPM
  In menu 'Analogue Inputs' option button `0V` has to be disabled and the function duty RPM . has to be assigned to an analogue input. Additionally a scaling has to be selected from the list box duty RPM (e.g.: 1V/10.000RPM)
  The value of the duty RPM is displayed on the LCD according to the scaling and the voltage at the input. A voltage of 0V leads to a standstill and a voltage higher than 0V leads to a startup upto the desired revolution. An input voltage of 4V and a scaling as above mentioned lead to a revolution of 40.000 rpm.

> **Important: For this setup "PIN 11-12 Start" has to be inactive!**
> **-> Please unclick this checkbox in the main window of SFU-Terminal**

The settings have to be downloaded into the converter with the button `write data`.

7.2 Starting and Stopping the Frequency Converter

There are different methods of starting and stopping **SFU 0102/0202** frequency converters, due to many different requirements, as follows below:

✓ manually via panel keys
✓ Remote control via digital input
✓ Remote control via analogue input
✓ Remote control via serial interface

Before starting the converter is possible, a preset of the RPM (> 7.4) has to be done. This is necessary for all options of starting with the exception of analogue starting.

✓ Manually via panel keys
Activation of spindle start via the green START key.
Spindle-stop is activated by the red STOP key on the operator panel.

✓ Remote control via digital input Start/Stop by external PLC or CNC
Digital Input 1 is the default. To change this, click on the menu '**digital inputs**'. The correct spindle characteristic can be preset here also.

Depending on your safety regulations, you can program this individually and set high or low active signals. In general, when using SPS control, it is best to set safety cut-outs at low-active, so that the machine will stop should a cable or connector defect occurs.

✓ Remotely via the analogue input
Analogue starting will be enabled where at least one of the analogue inputs in the menu '**analogue inputs**' is selected and a valid signal at the digital input Start/Stop is present. Additionally a scaling has to be selected from list-box duty RPM of analogue value to RPM.

✓ Remotely via the RS232 serial interface from a PC or PLC .
The speed pre-selected from the panel is taken as the required speed in this instance. Speed can be altered via commands from the RS232 interface.

The RS232 interface offers complete control of the **SFU 0102/0202** converter via the optional full- version Windows platform. The level of control this provides is almost at machine-level, so that this option is more appropriate for error evaluation and special control features via PC. If you need to control the **SFU 0102/0202** remotely, please contact BMR or your local distributor for assistance and the RS232 command-set.

⚠️ **Where one of the above options has been selected to operate the converter, only that preselected option can then be used to stop the converter! Only one of the safety functions can override the operation.**

7.3 Remote-Controlled Configuration of Direction of Rotation via Digital Inputs

Via digital input RPM direction . Setup is carried out in menu '**digital inputs**'. This is necessary, if the direction of rotation has to be controlled , for example, via a PLC. Reversal can only take place once the spindle / motor has come to a complete stop. If the direction pre-selection setting is changed whilst the spindle / motor is running, the spindle / motor will not turn in the new direction until it has been brought to a complete standstill and then restarted.
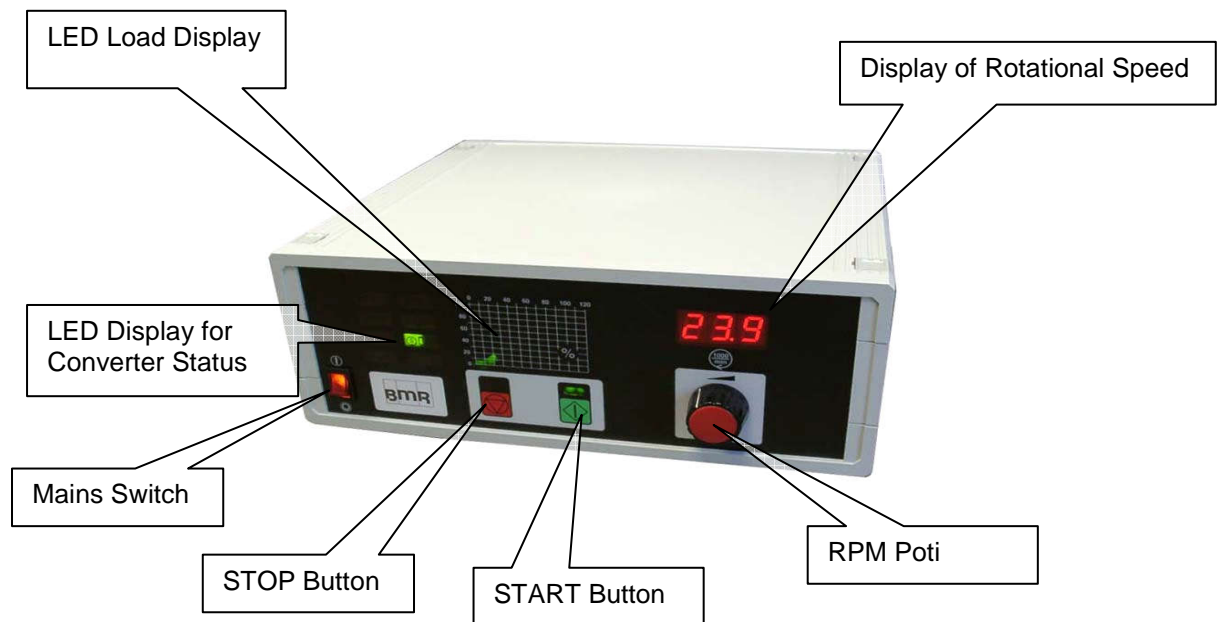
7.4 Safety stop functions

As shown above, all these safety and start-up features are programmable and a digital input pin or logical behaviour of this pin (high-, low-active) can be selected.

The following safety functions bring about controlled stopping of the machine, pre-defined by the deceleration times selected within the spindle characteristics,

✓ Safety stop by spindle overtemperature, if this function is activated and it's delay-time exceeded

✓ Safety stop by converter over-temperature and delay-time exceeded, specified in the form '**delays**' (accessed by delays button)

✓ Safety stop by overload and time delay exceeded (determined by maximum current and voltage in the spindle diagram and the form '**delays**', accessed by delays button)

✓ Immediate safety stop by over-current of the converter.

✓ Safety stop by emergency stop through digital input shutdown in form '**digital inputs**'

✓ The following stopping methods shut off the power stage and the spindle will slow down only though its own load. This process can take up to ten minutes until the spindle has fully stopped:

✓ Safety stop via short-circuit protection on digital input PDP Interrupt determined by internal converter current limit.

✓ Safety stop by digital input PWR stage off in the form '**digital inputs**'.

After an error flag has occurred, it have to be cleared by a Start/Stop sequence or a digital error reset with a digital input (in menu '**digital inputs**' Error reset). 4 seconds after error reset, the device is ready for operation again.

7.5 Control via LED Front Board

LED Load Display

Display of Rotational Speed

LED Display for Converter Status

Mains Switch

STOP Button

START Button

RPM Poti

Mains Switch

After the Power-button is switched "ON", the Frequency Converter starts an automatically self-test for about 8 seconds. During this time all displays flashes a short time one after another. After this automatical check the converter is ready for operation.
In case of defect the corresponding display flashes.

Spindle "Start"

After pressing the „START"-button the spindle starts to come up to the rotational speed adjusted by the rotary knob (11). The acceleration time is adjusted to 10.000 rps on factory default.
On request other acceleration times are possible.

Spindle "Stop"

After pressing the "STOP"-button the spindle will be electronically decelerated and stopped to standstill. The deceleration time corresponds to the adjusted acceleration time.
It's only possible to slow down the spindle with the „STOP"-button if the remote control is *not* „ON".
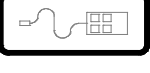By pressing power switch „OFF" there is no electronic slow down, but the spindle runs out by itself.
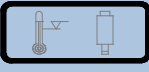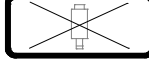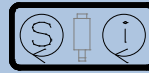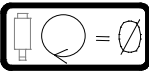
Digital Display of Rotational Speed

The digital display of rotational speed indicates the adjusted rotational speed by n x 1000

7.6 LED-Displays

Display for Converter

Display	Picture	Description
(2.1)		converter superheat
(2.2)		cconverter is not ready for operation
(2.3)	>100%	load of converter or load of spindle higher than 100%
(2.4)		remote control "ON"

Display for Spindle

Display	Picture	Description
(3.1)		spindle superheat
(3.2)		spindle is not ready for operation
(3.3)		rotational speed reaches "desired value" or "actual vaue", repectively
(3.4)		standstill of spindle

Load Display

The load display indicates the present load of spindle in %.

    "green area" = within the admissibility
    "red area" = overload

If the spindle is not loaded and no defect exists, the load-display indicates approx. „0%".

Overload Display

The display (2.3) always flashes, if the spindle was overloaded or the interruption for overload responded.

Overload Power Cut

If the spindle is running more than 10 seconds [programmable by software (1 ... 10 sec.)] an interruption for overload will follow.
I.e. after this time the converter automatically disconnects the spindle and the displays (2.2) and (2.3) are flashing.
Another „power-up" of the spindle can only follow if the display (2.2) disappears.
The display (2.3) disappears if the spindle is „powered-up" again.

Excess Temperature of Converter

In case the converter reaches the excess temperature the display (2.1) flashes.
Delayed with 3 seconds [programmable by software (1...10 sec.)] the converter switches to „STOP"
and the display (2.2) flashes.

The spindle can not be switched „ON" before the display (2.2) disappeared.

The display (2.1) disappears by another „power-up".

Excess Temperature of Spindle

In case the spindle reaches the excess temperature the display (3.1) flashes.

Delayed with 3 seconds [programmable by software (1...10 sec.)] the converter switches to „STOP"
and the display (3.2) flashes.

The spindle can not be switched „ON" before the display (3.2) disappeared.

The display (3.1) disappears by another „power-up".

> **ATTENTION:**   This evaluation is only possible if the spindle is equipped with a
> temperature   sensor.(Option after arrangements)

Remote Control

Optionally start behaviour through pin 11-12 connection at D-Sub 15

The remote control of the converter is connected via the 15-poles SUB-D-JACK (13).
The display (2.4) is on whenever the converter is remote controlled.

> **Tipp: It is recommended to usw a shielded cable**

POSSIBILITIES OF REMOTE CONTROLLING:

a)   **Digitally**: With a Start/Stop (0 / +24V) signal at digital input1/ Pin12 .
The input can be setup to be Low- or Hi-active. The value of rotational speed can be preset with the
Potentiometer or with a DC-voltage at Pin11-8

b)   **Analogue**: with a DC voltage at the analogue input. Connect (+) to Pin11 and (-) to Pin 8 (GND)
Precondition is a valid Start signal at Pin12
 Uin < 0,5V is Spindle "Standstill" and Uin $\geq$ 0,5V is Spindle "ON".
Equally herewith the rotational speed is controlled according to the scaling of speed to analogue value.
Possible is 1V/10.000rpM or 0-10V min/max.

> **ATTENTION:** The DC voltage at Pin11 must not excced 12V and should be free from ripple
> voltages

c)   **RS232**: with control commands via serial interface Pin13 (RxD), Pin14 (TxD) and Pin8 (GND)
A list of commands is available seperately on request.

> If a Start is initiated by one of the above mentioned start operating modes, a subsequent
> stop is accepted in the same mode only. This is valid not for safety functions

Rotational Speed Reached

If the spindle reaches the preset value of the rotational speed, one of the two halves of display (3.3) flashes.

The left half with the symbol „desired value" flashes if the internal frequency of the converter corresponds to the adjusted frequency.
This evaluation happens whenever the spindle is not equipped with a magneto resistor.

The right half of the symbol „actual value" flashes if the spindle axle reached the adjusted rotational-speed in fact (actual evaluation).

Standstill of Spindle

The display (3.4) flashes whenever the spindle axle stands still.

The converter considers two possibilities of the evaluation:

a) if the spindle is not equipped with a magneto resistor the symbol flashes when the converter stopped giving more frequency (standstill of converter)

b) if the spindle is equipped with a magneto resistor the symbol flashes not before the spindle-axle is standing still.

Configuration1 ➔ ROTATIONAL SPEED OUTPUT

With the control connector (13) Pin 4 (+) and Pin 8 (⊥) Ground, a direct voltage is given out which corresponds to the rotational speed of the spindle axle.   **1V / 10000 rpm**

Configuration 2 ➔ ACTIVE LOAD OUTPUT

With the control connector (13) Pin 4 (+) and Pin 8 (⊥) Ground, a direct voltage is given out which corresponds to the load of the spindle.   **0...10 V ≙ 0...100%**

> **INFORMATION:** Standard for delivery is the configuration "rotational speed output"!

Reversing Direction of Spindle

To arrange the reversing direction of rotation, apply a direct-voltage of +12V...24V on   Pin 5 of the Control-Cennector (13).
[Pin 8 (⊥) Ground]

This function is only possible, if the spindle-axle stands still. [display (3.4) flashes].

If you arrange or disable the signal during the spindle rotates, the direction or rotation   will be changed after the next „standstill of spindle".

Emergency Shutdown Interlock

The emergency shutdown interlock can be programmed by software „active" or „inactive". Programming „inactive" is insignificant, whereas with a „active" programming a primary stop-command can be given. This means that the converter cannot be started again neither   by the „Start-button" nor by the remote-control and that the spindle will be controlled slowed down.

To abolish the command „shutdown-interlock" there has to be applied a voltage of 5V...30V on the control connector (13)
Pin 15 (+) and Pin 8 (⊥).

> **ATTENTION: The Spindle is not grounded by the Converter, but it has to be grounded via the spindle-support**

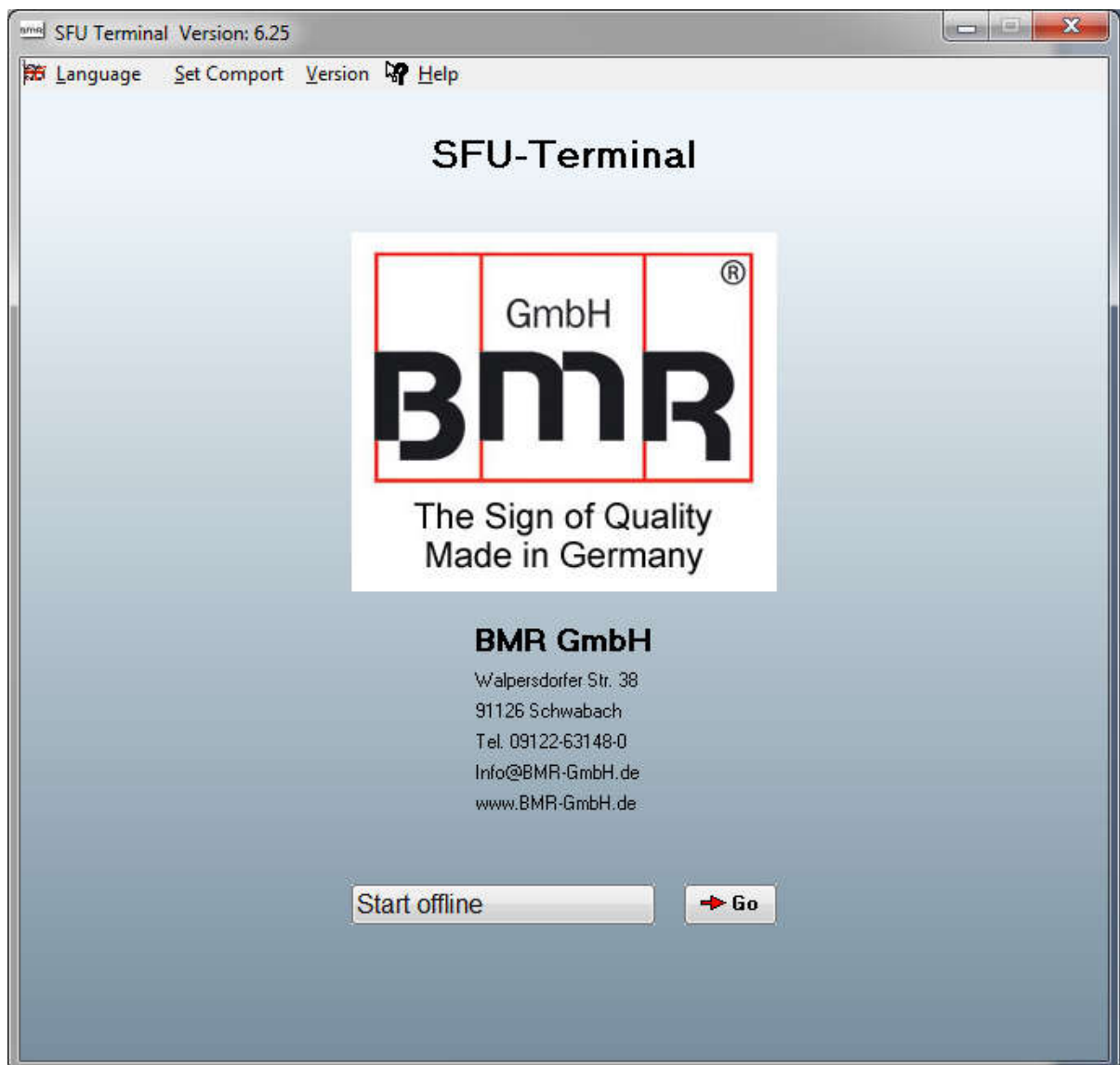## 7.7 Setting up different Diagrams via Front Board

To reach the menu first press the stop button and keep it down. Then press simultaneously the start button and hold both for about 5sec. After this the actual nr, of the current spindle is displayed. Now release the buttons. Now you can add one nr with the start button and take one with the stop button. If a diagram is not valid an „E" is displayed e.g. „E07" in order to show that diagram nr. 7 isn't valid. A valid nr. is displayed as „07" instead.
When approximately for 5 sec no button is pressed, the converter leaves the menu and is doing a reset and the init routine like the switch-on procedure.

8. Calibration and Configuration with Windows-Software

The software "*SFU-Terminal* " is an optional tool used to configure all frequency converters 0102...0601 and also provides the possibility of user-friendly data display and calibration, implemented as follows:

1. Start-up frequency converter and connect via RS232 interface.

2. Start-up program *SFUTerminal.exe*
   The interface is then configured automatically. A connected frequency converter is detected and all data transfer parameters are synchronised.

9. Errors, Trouble-Shooting

Error description	Help action
The converter isn't found during initialization of the Windows program	When using a laptop the voltage levels sometimes are too low. There are external boxes to boost this levels to the normalized values. Be sure to use a zero-modem cable During initialization the converter has to be turned on. Don't use cables longer than 2m
The LED shows "Spindle not ready"	Check whether the PTC in the spindle has a fault or is broken. Is the PTC connected properly ?(see chapter 9 examples) Is the spindle connected properly ? (see chapter 9 examples)
The LED shows "converter not ready"	Is overtemp. converter active (check fan...) The hardware switch has gone off- error reset via start, after release check whether spindle has blocked before re-starting the spindle. The normal current overload protection has tripped- re-start possible via start button or dig. pin eg. A dig. pin (emergency stop or power stage off) is still active- check the inputs. Check whether the right spindle diagram is chosen. When the hall sensor is active, but the hardware input is floating, error spikes prevent the spindle from starting- check the wiring of the hall sensor.
The spindle doesn't start in spite of "converter and spindle ready"	If one analogue input is released for external speed control, the spindle will start above the minimum required voltage level which corresponds to the min. speed set by the diagram. Also the dig. input Start pin has to be activated in parallel. When the green "start" LED appears, it could be that the motor cable has been put out after the self-test procedure

| Error description	Help action
The LCD (LED) shows "diagram error xx"	A non-valid diagram has been set. A valid diagram can be chosen through the up/down keys, (or start and stop LED version) restart with ESC key (or autom. after 6sec)
While the spindle is running the message "real rpm reached" vanishes and "duty rpm reached" comes when approaching higher speeds.	Probably a hall sensor with an incorrect gain is used. Normal values are from 560/280 Ohms. Check the values of the hall sensor.
The LCD(LED) shows "without spindle/cable" in spite of a spindle is connected to the output. (noS in LED version)	Check the cable or plugs or screw terminals. Probably a wrong diagram is set. The self-test prcedure takes the first value in the diagram for calculating the current which is needed to recognize the spindle correctly. -Check spindle type, diagram

10. EMC

The compliance with the limit values of EMC is the responsibility of the manufacturer of the machine or device.

This device was developed for use in industrial environments. For trouble-free operation and to reduce emitted interference, the following should be observed during wiring of the equipment:

✓ The EMC of a machine or device is affected by all connected components (motor spindle, length and type of cables, wiring, etc..). Under certain conditions the use of additional filters can be necessary to maintain the current laws.

✓ The earth and shield connections of all those devices used in conjunction with the frequency converter should be as short as possible and have as large a cross-section as possible.

✓ Control devices used with the frequency converter (PLC, CNC, IPC, ...) should be connected to a common earth/earth terminal bar

✓ All connections both to and from the frequency converter should be via shielded cable.

✓ Supply cables, motor cables and control cables must be completely isolated from each other. Where crossing cannot be avoided, cables should be laid at 90° to each other.

✓ The control cable should be laid as far away as possible from the load cable.

11. Housing variants

SFU 0102/0202 SSE with LED Panel
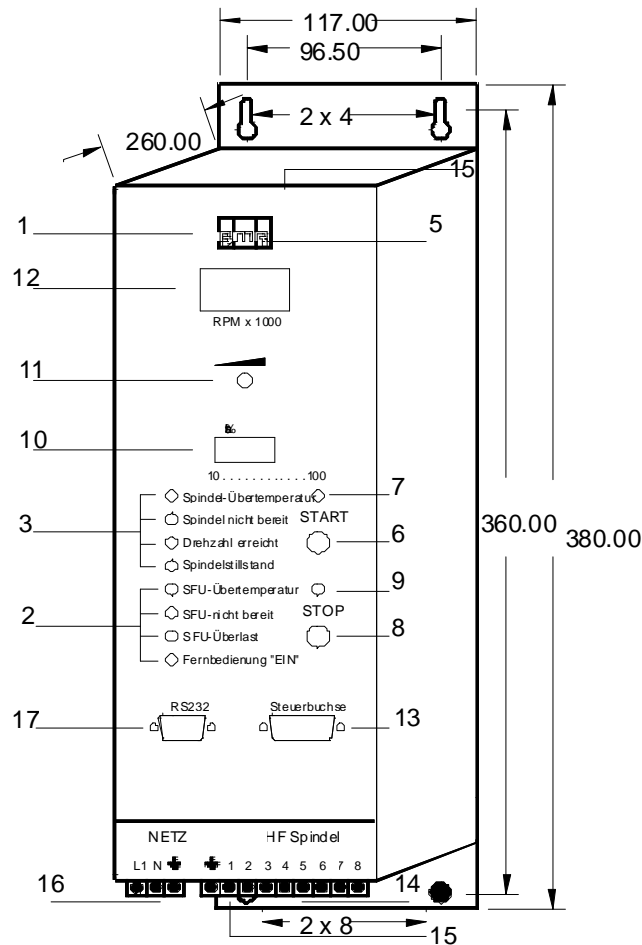
1. housing
2. display for changer
3. display for spindle
4. ----
5. manufacturers emblem
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector - 15 poles (back)
14. spindle connector - 7 poles (back)
15. vent
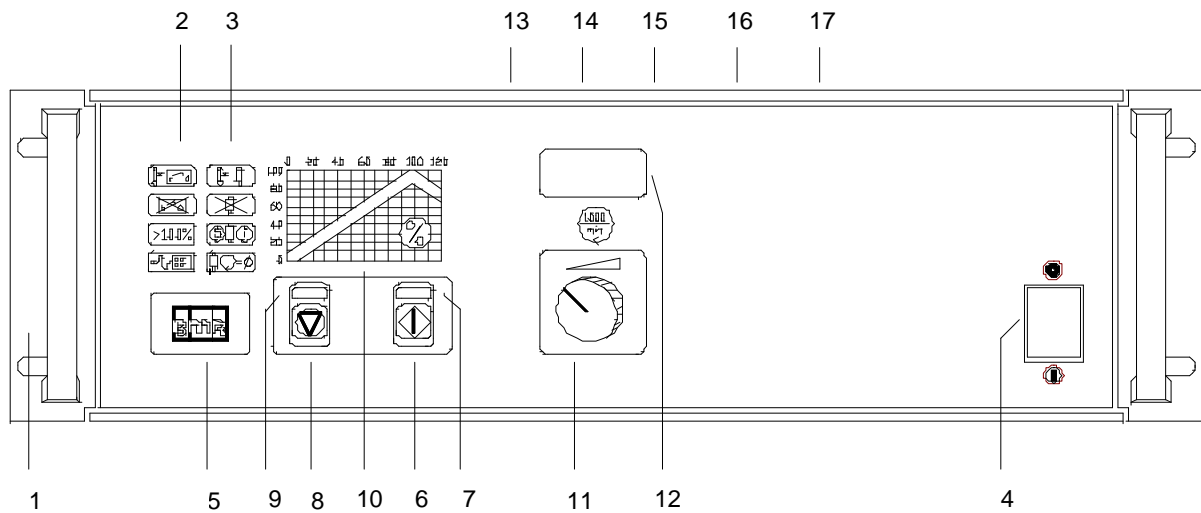16. power supply (back)
17. RS 232
18. ----
19. ----
20. ----

SFU 0102/0202 (Desktop) with LED Panel or LCD Display
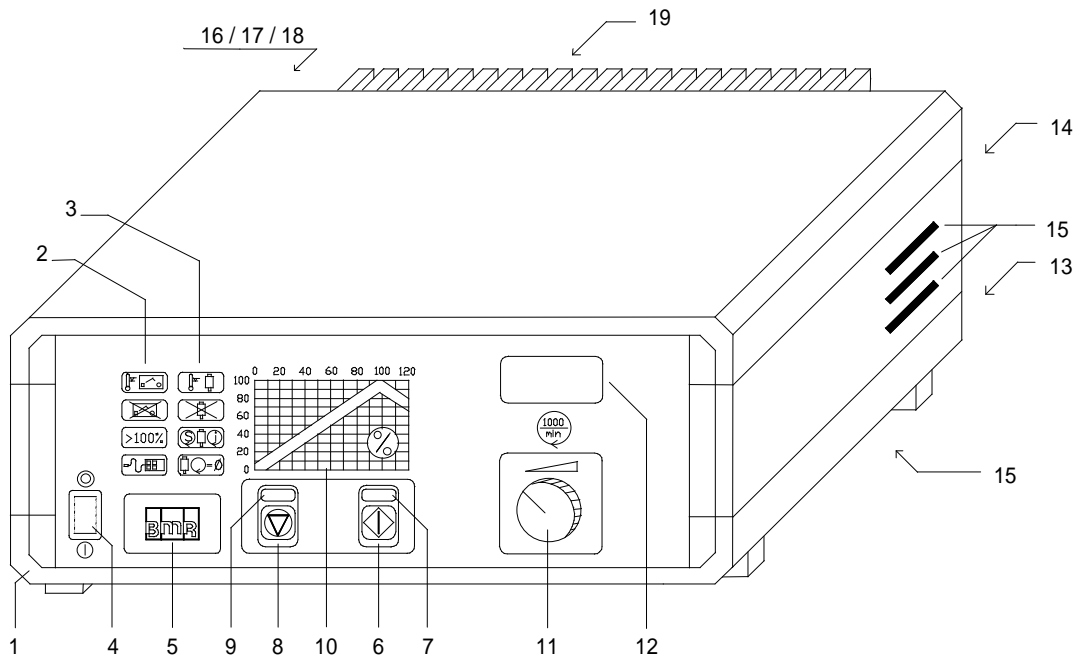
1. housing
2. display for changer
3. display for spindle
4. power switch
5. manufacturers emblem
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector 15 poles (back)
14. spindle connector (back)
15. vent

power supply (back)

16. ----
17. safeguard (back)
18. IAS-connector - 25 poles (back)
    only by configuration IAS
19. heat sink
20. ----

## SFU 0102/0202 as 19''-Rack with LED Panel or LCD Display

1. housing
2. display for changer
3. display for spindle
4. power switch
5. manufacturers emblem
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector - 15 poles (back)
14. spindle connector - 7 poles (back)
15. vent
16. power supply (back)
17. safeguard (back)
18. ----
19. ----
20. ----

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100%	**„Made in Germany"**
100%	**precision**
100%	**reliability**
100%	**support**
100%	**flexibility**

Subject to technical alterations.
June 2016
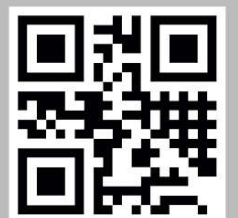
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